Chapter 11: Water and Sewer Infrastructure

A. INTRODUCTION

New York City's water and sewer infrastructure is fundamental to the operation, health, safety, and quality of life of the City and its environment. Ensuring these systems have adequate capacity to accommodate land use or density changes and new development is critical to avoiding environmental and potential public health issues that may arise from water pressure reductions, sewer back-ups, or street flooding.

This chapter therefore assesses the potential effects of the Proposed Actions on the City's water supply, wastewater treatment, and stormwater management infrastructure in accordance with the 2021 *City Environmental Quality Review (CEQR) Technical Manual*.

PRINCIPAL CONCLUSIONS

As summarized below, the Proposed Actions would not result in any significant adverse impacts on the City's water supply, wastewater treatment, or stormwater management infrastructure.

WATER SUPPLY

The Proposed Actions would not result in any significant adverse impacts on the City's water supply system. Projected development under the Proposed Actions is expected to generate an incremental water demand of 6.59 million gallons per day (mgd) as compared to conditions in the future absent the Proposed Actions (the No Action condition). This represents an approximately 0.6 percent increase in demand on the water supply system compared to the City's average daily water use of approximately 1.1 billion gallons per day (gpd). Existing water mains in the Project Area are expected to have sufficient capacity to handle the estimated increase in water demand.

WASTEWATER TREATMENT

The Project Area is served by the Bowery Bay Wastewater Resource Recovery Facility (WRRF) and within the Project Area there are five subcatchment drainage areas. Development in the future with the Proposed Actions (the With Action condition) is expected to generate a total of approximately 4.85 mgd of sanitary sewage, which represents an increase of approximately 3.64 mgd over the No Action condition. With an existing average monthly flow of 113 mgd (below the maximum dry weather flow permitted capacity of 150 mgd) and the addition of approximately 3.64 mgd on the projected development sites, which would represent 3.2 percent of the average monthly flow, the Bowery Bay WRRF would continue to have reserve capacity. Therefore, it is concluded that there would be no significant adverse impact to the City's wastewater treatment services as a result of the Proposed Actions.

STORMWATER AND DRAINAGE MANAGEMENT

All the projected development sites identified under the Reasonable Worst-Case Development Scenario (RWCDS) are located within five subcatchment areas of the Bowery Bay WRRF. This is a combined sewer service area, and with the Proposed Actions there would be an increase in sanitary flow from the increased residential, commercial, and community facility populations, as well as an increase in fully impervious rooftop area on the majority of the projected development sites. These additional flow volumes would be conveyed to the Bowery Bay WRRF or discharged directly to the East River as combined sewer overflow (CSO), depending on rainfall volume and duration. However, with the Proposed Actions, CSO volumes are expected to decrease as compared with the No Action condition, regardless of the projected increase in sanitary flows from the new development. This reduction in CSO volumes can be attributed to the increased direct stormwater discharge from the waterfront projected development sites, as well as the on-site stormwater management volume requirements that would be followed under the City's Unified Stormwater Rule, which would require any new and/or redeveloped properties in a CSO drainage area to increase the total volume of stormwater managed on site. Finally, because of the available capacity of the Bowery Bay WRRF, the projected increase in sanitary flows would not result in any significant adverse impacts on the WRRF infrastructure. Therefore, it is concluded that the Proposed Actions would not result in any significant adverse impacts related to the City's wastewater conveyance and treatment systems.

B. METHODOLOGY

According to the *CEQR Technical Manual*, a preliminary water supply infrastructure analysis is needed if a project would result in an exceptionally large demand for water (e.g., more than one million gpd) or is in an area that experiences low water pressure (e.g., areas at the end of the water supply distribution system). The Proposed Actions are expected to result in a water demand of more than one million gpd compared with the No Action condition. Therefore, an assessment of water supply is warranted.

The *CEQR Technical Manual* states that for wastewater and stormwater conveyance and treatment analyses, a preliminary assessment is needed if a project is in a combined sewer area and would exceed the following incremental development of residential units or commercial space above the No Action condition: (a) 1,000 residential units or 250,000 square feet of commercial and/or community facility space in Manhattan; or (b) 400 residential units or 150,000 square feet of commercial space in the Bronx, Brooklyn, Staten Island, or Queens. Since the Project Area is located in a combined sewer area in Queens, and the Proposed Actions would result in a net increase of more than 400 residential units and more than 150,000 square feet of commercial and community facility space, an assessment of wastewater and stormwater infrastructure is provided.

To assess the potential impacts of the Proposed Actions on water and sewer infrastructure, this chapter:

- Describes the existing water and sewer infrastructure serving the Project Area;
- Describes planned No Action infrastructure improvements in the Project Area, project components, and current schedules;

- Provides a preliminary analysis which estimates water demand and sewage generation on the projected development sites under existing and No Action conditions based on use generation rates provided in the *CEQR Technical Manual* and the 2016 *East New York Rezoning Proposal Final Environmental Impact Statement (FEIS)*. The preliminary analysis also calculates stormwater runoff and sanitary flows using the New York City Department of Environmental Protection (DEP) Volume Calculation Matrix. The preliminary analysis then forecasts water demand and sewage and stormwater generation from the projected developments based on *CEQR Technical Manual* guidelines; and
- Assesses the effects of the With Action water demand and sewage and stormwater generation on the City's water and sewer infrastructure based on the preliminary and detailed analyses, in accordance with the *CEQR Technical Manual*.

C. PRELIMINARY ANALYSIS

EXISTING CONDITIONS

WATER SUPPLY

The New York City water supply system comprises a network of reservoirs, lakes, and aqueducts extending into the Catskill region and a pipe network that distributes water within the City. New York City obtains nearly all of its water from the Delaware, Catskill, and Croton watersheds, which are within 125 miles of the City. Water from the watersheds is stored at 19 reservoirs and 3 control lakes with a combined capacity of approximately 550 billion gallons. The water is then carried into the City by a number of aqueducts. The water enters the City via City Tunnel 1 (which runs through the Bronx, Manhattan, and Queens) and City Tunnel 2 (which runs through the Bronx, Queens, and Brooklyn). The partially completed City Tunnel 3 currently serves the Bronx, Manhattan, and Queens, and when complete, will terminate in Brooklyn. Staten Island obtains its water via the Richmond Tunnel, which is an extension of City Tunnel 2.

Once in the City, the three aqueducts distribute water into a network of water mains. Water mains up to 96 inches in diameter feed smaller mains that deliver water to their final destination. Nearly all the water reaches its consumers by gravity alone, although some 4 percent (generally at the outer limits of the system where in-line pressure is lowest, at high elevations, or at a pressure extremity, such as Far Rockaway) is pumped to its final destination. Pressure regulators throughout the City monitor and control the water pressure.

As discussed in Chapter 1, "Project Description," the RWCDS is used to assess the effects of the Proposed Actions. **Table 11-1** shows the existing uses on the 52 projected development sites and their associated water consumption and wastewater generation rates. Based on the presented water consumption rates, it is estimated that the existing uses on the projected development sites currently consume approximately 774,544 gpd, including approximately 404,956 gpd for domestic uses and approximately 369,588 gpd for air conditioning.

Table 11-1
Existing Water Consumption

Land Use[1]	Water Consumption and Wastewater Generation Rates[1]	Area/Units	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[2] A/C: 0.17 gpd/sf	9,273 sf (12 DU)	2,800	1,576
Retail	Domestic: 0.24 gpd/sf A/C: 0.17 gpd/sf	41,905 sf	10,057	7,124
Office	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	748,395 sf	74,840	127,227
Other Commercial	Domestic: 0.24 gpd/sf[3] A/C: 0.17 gpd/sf	112,870 sf	27,089	19,188
Warehouse / Manufacturing / Auto-Related	Domestic: 0.23 gpd/sf[4] A/C: 0.17 gpd/sf	1,261,608 sf	290,170	214,473
			Project Area—Total Water Demand	**774,544**
			Project Area—Total Wastewater Generation	**404,956**

Notes:
Totals may not sum due to rounding.
DU = dwelling unit; sf = square feet
[1] Consumption rates from *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.
[2] Assumes 2.30 residents per DU (average household size for Queens Community Districts [CDs] 1 and 2).
[3] Consumption for Other Commercial uses estimated assuming rates for retail space.
[4] Based on *East New York Rezoning Proposal FEIS* (equal to 10,000 gpd/acre); calculated based on total building floor area.

WASTEWATER TREATMENT

According to the *CEQR Technical Manual*, wastewater is considered to include sanitary sewage, wastewater generated by industries, and stormwater. Water used for air conditioning generates a negligible amount of wastewater as it recirculates or evaporates in the cooling and heating process. As discussed in Chapter 1, "Project Description," a RWCDS has been developed in conjunction with the Proposed Actions. **Table 11-1** shows the existing uses on the 52 projected development sites and their associated water consumption and wastewater generation rates. Based on the presented wastewater generation rates, the total estimated sanitary sewage generated on the projected development sites under existing conditions is 404,956 gpd.

Much of New York City's wastewater treatment system comprises the sewer network underneath the streets and the 14 WRRFs throughout the City. Most of the City's sewers are combined sewers that collect both sanitary sewage and stormwater. In periods of dry weather, the combined sewers (sized to convey an amount of sanitary sewage that is based on density levels according to zoning regulations) convey only sanitary sewage. During and immediately after wet weather, combined sewers can experience a much larger flow due to stormwater runoff collection. To control flooding at the WRRFs, regulators built into the system serve as relief valves, allowing only approximately two times the amount of design dry weather flow into the interceptors (larger sewers that convey wastewater to the WRRFs). The interceptors then take the allowable flow to the WRRFs, while the excess flow is discharged untreated to the nearest waterbody as CSO.

During the 1990s, the City instituted a range of water conservation measures in response to excess flows to the City's WRRFs that exceeded the dry weather flow allowed in accordance with their respective State Pollutant Discharge Elimination System (SPDES) permits. Measures included equipping fire hydrants with locks to prevent illegal uses and

requiring that all new plumbing fixtures in the City (including replacements in existing structures and new fixtures in new structures) be of a low-flow design (Local Law No. 29, 1989). The City also implemented a meter program, installing water meters at thousands of properties where water fees had previously been based on property frontage rather than usage. This metering provided a new financial incentive to identify and repair leaks in the water distribution system. These programs have reduced water demand and load at the City's WRRFs. At many WRRFs, this reduction has been in the order of magnitude of several million gpd. Overall, actual water demand is down more than 30 percent since the 1990s, despite population growth. DEP projects that savings from the continued implementation of these and other conservation measures will exceed any increases in water demand from consumers.

The Project Area is served by combined sewers that convey flows to the Bowery Bay WRRF, located in the Astoria neighborhood in northern Queens. Here, wastewater is fully treated by physical and biological processes before it is discharged as effluent. The quality of the effluent is regulated by a SPDES permit issued by the New York State Department of Environmental Conservation (DEC), which establishes limits for effluent parameters (i.e., suspended solids, fecal coliform bacteria, and other pollutants). Since the volume of flow to a WRRF affects the level of treatment a plant can provide, the SPDES permit also establishes a maximum permitted capacity. For the Bowery Bay WRRF, the maximum permitted capacity is 150 mgd; the average monthly flow to the Bowery Bay WRRF is 113 mgd,[1] which is approximately 75 percent of the permitted capacity.

The 52 projected development sites are served by five Bowery Bay WRRF subcatchment areas. **Table 11-2** shows the estimated existing wastewater generated on the projected development sites within each of the affected subcatchment areas.

Table 11-2
Existing Wastewater Generation on the Projected Development Sites by Subcatchment Area

Subcatchment Area	Domestic Water/Wastewater Generated on the Projected Development Sites (gpd)*
BB-L15	0
BB-L16	79,487
BB-L17	177,185
BB-L18	137,601
BB-L19	10,682

Note: * See **Table 11-1** for domestic water/wastewater generation methodology.

STORMWATER AND DRAINAGE MANAGEMENT

Stormwater runoff from impermeable surfaces on the projected development sites is collected and conveyed by the City's combined sewer system to the Bowery Bay WRRF. As noted above, regulators allow only twice the dry weather design flow into interceptors. During storm events, excess flow is discharged as CSO. The analysis of stormwater management typically focuses on the body of water into which stormwater is discharged

[1] Average monthly flow for the 12-month period through August 2024, the latest period for which data are available.

during a CSO event. In this case, CSO from the Project Area is discharged through outfalls to the East River.

The 52 projected development sites within the Project Area are predominantly a mix of buildings and paved areas (such as undeveloped lots). The combined total area of the projected development sites is approximately 2,423,910 square feet (55.65 acres). **Table 11-3** summarizes the surfaces and surface areas within each subcatchment area, as well as the weighted runoff coefficient (the fraction of precipitation that becomes surface runoff for each surface type).[2]

Table 11-3
Existing Surface Coverage

Subcatchment Area	Surface Type	Roof	Pavement and Walkways	Other	Grass and Softscape	Total
BB-L15	Area (percent)	0%	100%	0%	0%	100%
	Surface Area (sf)	0	60,069	0	0	60,069
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.85**
BB-L16	Area (percent)	79%	21%	0%	0%	100%
	Surface Area (sf)	261,786	69,174	0	0	330,960
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.97**
BB-L17[1]	Area (percent)	62%	36%	0%	1%	100%
	Surface Area (sf)	660,936	387,955	0	14,064	1,062,955
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.93**
BB-L18	Area (percent)	72%	28%	0%	0%	100%
	Surface Area (acres)	481,387	187,657	0	0	669,044
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.96**
BB-L19	Area (percent)	46%	54%	0%	0%	100%
	Surface Area (acres)	43,898	52,183	0	0	96,081
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.92**

Notes: Totals may not sum due to rounding; sf = square feet
* Weighted Runoff Coefficient calculations based on the Flow Volume Calculation Matrix provided in the *CEQR Technical Manual*.
1. Projected Development Site 69, which is located in the BB-L17 subcatchment area, is a vacant parcel along the East River that is not connected to the sewer system and is partially underwater; this site (approximately 204,801 sf) is assumed to have direct stormwater drainage and is not included in the surface coverage calculations.

UNIFIED STORMWATER RULE

In February 2022, DEP adopted the Unified Stormwater Rule, which amended on-site stormwater management requirements for new and redevelopment projects in combined sewer areas. The Unified Stormwater Rule was an update to the previous regulations (2012 Stormwater Rule) that reduce peak discharges to the City's sewer system during rain events by requiring greater on-site storage of stormwater runoff and slower release to the sewer system. Specifically, DEP adopted amendments to Chapters 31 and 19.1 of Title 15 of the Rules of the City of New York (RCNY) as part of the Unified Stormwater Rule.

Under the Chapter 31 amendments, the Unified Stormwater Rule increases the amount of stormwater required to be managed on-site and further restricts the release rates for all new and redevelopment projects that require a DEP House or Site Connection

[2] Lot coverage (rooftop, paved area, and unpaved softscape) for each development site was estimated using City land cover data and aerial photography.

Proposal Application (SCP). Additionally, under the Chapter 19.1 amendments, sites that disturb 20,000 square feet or more of soil or increase impervious surfaces by 5,000 square feet or more will also be required to manage the Water Quality Volume (WQv), currently defined as 1.5 inches over the lot area, using stormwater management practices (SMPs) dictated by DEP SMP hierarchies. DEP has developed hierarchies for both combined and separate sewer areas. The SMP hierarchies prioritize vegetated retention SMPs for both drainage areas with stormwater volume control and stormwater treatment communicated as the underlying goals for combined and separate sewer areas, respectively. For sites that trigger the Chapter 19.1 component of the Unified Stormwater Rule, the hierarchy is mandatory, meaning that developers must start with the most preferred SMP and provide documentation of site constraints that prevent implementation in order to move to the next SMP.

The Unified Stormwater Rule is expected to result in substantial improvements to the way that individual new and redeveloped properties manage stormwater compared with the 2012 Stormwater Rule it replaced. In some cases, stormwater will be entirely prevented from entering the sewer system through retention and, in most cases, stormwater that does enter the system will be reduced and/or treated and released at a lesser rate, allowing the system to operate more efficiently during peak wet weather events.

In combined sewersheds such as the portion of Queens that contains the Project Area, the Unified Stormwater Rule is expected to lead to a reduction in CSO volume, as more lots redevelop over time. The analyses of stormwater flows presented in this assessment conservatively do not account for the recommendations of the Unified Stormwater Rule and design guidance included within.

THE FUTURE WITHOUT THE PROPOSED ACTIONS (NO ACTION CONDITION)

In the No Action condition in 2035, the projected development sites are assumed to either remain unchanged from existing conditions or become occupied by uses that are as-of-right under existing zoning reflective of current trends. As discussed in Chapter 1, “Project Description,” under the RWCDS, the total No Action development on the 52 projected development sites would comprise approximately 2,311 residential units, 341,300 square feet of retail, restaurant and grocery store uses, 1,808,364 square feet of office space, 53,470 of other commercial space, and 1,724,635 square feet of industrial space.

WATER SUPPLY

Table 11-4 summarizes the water demand and sewage generation in the No Action condition: it is estimated that the projected development sites would generate approximately 2,255,724 gpd (2.2 mgd) of wastewater, including approximately 1,203,747 gpd for domestic uses and approximately 1,051,977 gpd for air conditioning. This would represent an incremental increase of approximately 1,481,180 gpd (1.5 mgd) as compared to existing conditions.

Table 11-4
No Action Condition Water Consumption

Land Use[1]	Water Consumption and Wastewater Generation Rates[1]	Area/Units	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[2] A/C: 0.17 gpd/sf	2,260,332 sf (2,311 DU)	531,500	384,256
Retail	Domestic: 0.24 gpd/sf A/C: 0.17 gpd/sf	341,300 sf	81,912	58,021
Office	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	1,808,364 sf	180,836	307,422
Other Commercial	Domestic: 0.24 gpd/sf[3] A/C: 0.17 gpd/sf	53,470 sf	12,833	9,090
Warehouse / Manufacturing / Auto-Related	Domestic: 0.23 gpd/sf[4] A/C: 0.17 gpd/sf	1,724,635 sf	396,666	293,188
			Project Area—Total Water Demand	**2,255,724**
			Project Area—Total Wastewater Generation	**1,203,747**

Notes:
Totals may not sum due to rounding.
sf = square feet; U = dwelling unit;
1. Consumption rates from *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.
2. Assumes 2.30 residents per DU (average household size for Queens Community Districts [CDs] 1 and 2).
3. Consumption for Other Commercial uses estimated assuming rates for retail space.
4. Based on *East New York Rezoning Proposal FEIS* (equal to 10,000 gpd/acre); calculated based on total building floor area.

Additionally, in 2011, DEP launched the Water for the Future Program (WFF), a comprehensive long-term planning effort to repair leaks in sections of the Delaware Aqueduct. To support this program, DEP created a Demand Management Unit that developed a citywide strategy for the implementation of water demand management projects: the resulting *Water Demand Management Plan* identified five key strategies for managing water demand in New York City and detailed 21 specific initiatives in order to achieve targeted water demand reductions. It is anticipated that these initiatives will offset much of the increased demands citywide that may result from population growth and new development.

SEWER SYSTEM AND WASTEWATER TREATMENT

As shown in **Table 11-4**, in the No Action condition, wastewater generated on the Projected Development Sites would total 1,203,747 gpd, an incremental increase of 798,791 gpd over existing conditions. This additional sanitary discharge to the Bowery Bay WRRF would be well within the capacity available at the plant on average; therefore, the WRRF would continue to operate within its design capacity.

Table 11-5 shows the estimated wastewater generated on the projected development sites within each of the affected subcatchment areas in the No Action condition.

Table 11-5
No Action Condition Wastewater Generation on the Projected Development Sites by Subcatchment Area

Subcatchment Area	Domestic Water/Wastewater Generated on the Projected Development Sites (gpd)*
BB-L15	29,963
BB-L16	150,934
BB-L17	599,639
BB-L18	362,935
BB-L19	60,275

Note: * See **Table 11-4** for domestic water/wastewater generation methodology.

STORMWATER FLOWS

In the No Action condition, surface coverage would change on the projected development sites, primarily as a result of new developments that would introduce new buildings on vacant parcels; therefore, an increase in fully impervious rooftop space would be expected. Overall, surface coverage in the No Action condition would be expected to be similar to surface coverage in the With Action condition (discussed below), and the stormwater runoff coefficient would be similar to or higher than the existing condition in all affected subcatchment areas.

As required by the DEP regulations and the recently adopted Unified Stormwater Rule (described above), sanitary and stormwater source control BMPs would be used to reduce sanitary volume and peak stormwater runoff volumes to the combined sewer system. The No Action condition buildings on the projected development sites would be required to incorporate low-flow plumbing fixtures to reduce sanitary flow. In addition, stormwater detention would be required as part of the DEP site connection approval process for new construction that connects to the City's sewer system. The flow generated from the sites would be detained and restricted with an outlet control. Through the use of this system, the developed peak flow rate is restricted to the allowable peak flow rate with an additional 10 percent restriction in conformance with DEP standards to reduce the peak flow rate to the City's combined sewers.

In addition, in the No Action condition, several waterfront projected development sites—Projected Development Sites 67 and 69, which front on the East River, and Projected Development Site 71, which fronts on Anable Basin—are expected to undergo redevelopment with as-of-right uses. These as-of-right developments would be required to incorporate stormwater management systems that would collect all stormwater and covey it to the water body, in conformance with DEP regulations. With this direct stormwater discharge, as compared to existing conditions, there would be a reduction of stormwater discharge to the combined sewer system in the No Action condition on the sites that currently discharge to the combined sewer (i.e., Projected Development Sites 67 and 71).

THE FUTURE WITH THE PROPOSED ACTIONS (WITH ACTION CONDITION)

In the 2035 With Action condition, the total development expected to occur on the 52 projected development sites would consist of approximately 16,697,149 square feet of residential floor area (approximately 17,010 dwelling units), 5,630,584 square feet of

commercial uses, 930,150 square feet of industrial uses, and 291,784 square feet of community facility uses. The projected incremental (net) change between the With Action and No Action conditions that would result from the Proposed Actions would be an increase of 14,436,817 square feet of residential floor area, 3,427,450 square feet of commercial space, 291,784 square feet of community facility space, and a net decrease of 794,485 square feet of industrial on the projected development sites.

WATER SUPPLY

As shown in **Table 11-6**, the With Action condition on the projected development sites would result in a total water demand of 8,849,462 gpd (approximately 8.85 mgd); this would be an increase in incremental water demand of approximately 6.59 mgd as compared to the No Action condition. This represents an approximately 0.6 percent increase in demand on the water supply system compared to the City's average daily water use of approximately 1.1 billion gpd. The existing water mains in the Project Area are expected to be capable of handling this increase in water demand. Therefore, there would be no significant adverse impact on the City's water supply.

Table 11-6
With Action Condition Water Consumption

Land Use[1]	Water Consumption and Wastewater Generation Rates[1]	Area/Units	Domestic Water/Wastewater Generation (gpd)	Air Conditioning (gpd)
Residential	Domestic: 100 gpd/person[2] A/C: 0.17 gpd/sf	16,697,149 sf (17,010 DU)	3,912,300	2,838,515
Retail	Domestic: 0.24 gpd/sf A/C: 0.17 gpd/sf	911,053 sf	218,653	154,879
Office	Domestic: 0.10 gpd/sf A/C: 0.17 gpd/sf	4,373,824 sf	437,382	743,550
Life Sciences	Domestic: 0.10 gpd/sf[3] A/C: 0.17 gpd/sf	345,707 sf	34,571	58,770
Community Facility	Domestic: 0.10 gpd/sf[43] A/C: 0.17 gpd/sf	291,784 sf	29,178	49,603
Warehouse / Manufacturing / Auto-Related	Domestic: 0.23 gpd/sf[4] A/C: 0.17 gpd/sf	930,150 sf	213,935	158,126
Project Area—Total Water Demand				**8,849,462**
Project Area—Total Wastewater Generation				**4,846,019**
No Action to With Action Incremental Water Supply Demand				**6,593,738**
No Action to With Action Incremental Sewage Generation				**3,642,272**

Notes:
Totals may not sum due to rounding.
sf = square feet; DU = dwelling unit
[1] Consumption rates from *CEQR Technical Manual* Table 13-2, "Water Usage and Sewage Generation Rates for Use in Impact Assessment," unless otherwise noted.
[2] Assumes 2.30 residents per DU (average household size for Queens Community Districts [CDs] 1 and 2).
[3] Consumption for Life Sciences and Community Facility uses estimated assuming rates for office space.
[4] Based on *East New York Rezoning Proposal FEIS* (equal to 10,000 gpd/acre); calculated based on total building floor area.

WASTEWATER TREATMENT

In the With Action condition, wastewater from the projected development sites would continue to be treated at the Bowery Bay WRRF. The capacity of the plant would not change as a result of the Proposed Actions, and the facility would continue to operate within its SPDES-permitted dry weather flow capacity (150 mgd).

As shown in **Table 11-6**, under the RWCDS, development on the projected development sites is expected to generate a total of approximately 4,846,019 gpd (4.85 mgd) of sanitary sewage, divided among the five affected subcatchment areas (summarized in **Table 11-7**).

Table 11-7
With Action Condition Wastewater Generation on the Projected Development Sites by Subcatchment Area

Subcatchment Area	Domestic Water/Wastewater Generated on the Projected Development Sites (gpd)*
BB-L15	97,100
BB-L16	713,731
BB-L17	2,669,068
BB-L18	1,056,012
BB-L19	310,208
Note: * See **Table 11-6** for domestic water/wastewater generation methodology.	

The With Action sanitary sewage generation (approximately 4,846,019 gpd) would represent an increase of approximately 3,642,272 gpd (approximately 3.64 mgd) over the No Action condition (see **Table 11-4**). With an existing flow of 113 mgd (below the maximum permitted dry weather flow capacity of 150 mgd) and the addition of approximately 3.64 mgd on the projected development sites, the Bowery Bay WRRF would continue to have reserve capacity. Pursuant to *CEQR Technical Manual* guidelines, as the demand associated with the Proposed Actions would be well within the capacity of the affected WRRF, the preliminary analysis finds that no significant adverse impacts to the capacity of the City's wastewater treatment services would occur as a result of the Proposed Actions.

STORMWATER AND DRAINAGE MANAGEMENT

In the With Action condition, similar to the No Action condition, it is anticipated that the amount of surface area comprised of roofs would increase, as vacant lots and underutilized properties are developed. However, it is also anticipated that the amount of softscape surface area would increase in the With Action condition as a result of the introduction of publicly accessible open space: specifically, the waterfront projected development sites (Projected Development Sites 63, 64, 65, 67, 69, 71) are expected to introduce approximately six acres of waterfront public open space pursuant to the updated (Waterfront Access Plan).[3]

Table 11-8 summarizes the projected development sites' surface areas in the five affected subcatchment areas in the With Action condition. As noted above, the waterfront projected development sites would be required to incorporate stormwater management systems that would collect all stormwater and convey it to the water body, in conformance with DEP regulations. Therefore, the surface area of the waterfront projected development sites that would feature direct stormwater discharge (located in the BB-L16 and BB-L17

[3] For purposes of the surface area calculations, the public open space on Projected Development Sites 63, 64, 65, 67, 69, 71 is assumed to be 50 percent softscape (e.g., landscaping and planted areas) and 50 percent pavement (e.g., walkways).

subcatchment areas) is estimated separately from the projected development sites that would discharge stormwater to the combined sewer system. With this direct stormwater discharge from the waterfront projected development sites, as compared to existing conditions, there would be a reduction of stormwater discharge to the combined sewer system in the With Action condition.

Table 11-8
With Action Condition Surface Coverage

Subcatchment Area	Surface Type	Roof	Pavement and Walkways	Other	Grass and Softscape	Total
BB-L15	Area (percent)	95%	5%	0%	0%	100%
	Surface Area (sf)	57,000	3,069	0	0	60,069
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.99**
BB-L16—CSS	Area (percent)	82%	18%	0%	0%	100%
	Surface Area (sf)	163,724	34,855	0	0	198,579
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.97**
BB-L16—DD	Area (percent)	59%	25%	0%	15%	100%
	Surface Area (sf)	78,523	33,478	0	20,380	**132,381**
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.84**
BB-L17—CSS	Area (percent)	80%	20%	0%	0%	100%
	Surface Area (sf)	467,342	113,383	0	0	580,725
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.97**
BB-L17—DD	Area (percent)	45%	39%	0%	16%	100%
	Surface Area (sf)	309,841	267,408	0	109,782	**687,031**
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.81**
BB-L18	Area (percent)	92%	8%	0%	0%	100%
	Surface Area (acres)	614,770	54,274	0	0	669,044
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.99**
BB-L19	Area (percent)	70%	30%	0%	0%	100%
	Surface Area (acres)	67,098	28,983	0	0	96,081
	Runoff Coefficient*	1.00	0.85	0.85	0.20	**0.95**

Notes: Totals may not sum due to rounding.
sf = square feet; CSS = Combined Sewer System; DD = Direct Drainage
* Weighted Runoff Coefficient calculations based on the Flow Volume Calculation Matrix provided in the *CEQR Technical Manual*.

As a result of these anticipated surface area changes, the weighted runoff coefficients for the majority of the projected development sites within the affected subcatchment areas are expected to increase as compared to existing conditions; however, the weighted runoff coefficients would be substantially lower on the waterfront projected development sites, and these sites would directly discharge stormwater to the river rather than to the combined sewer system.

Using the sanitary and stormwater flow calculations, the Flow Volume Calculation Matrix was completed for the existing conditions and the With Action condition for each subcatchment area. The calculations from the Flow Volume Calculation Matrix help to determine the change in wastewater flow volumes to the combined sewer system from existing conditions to With Action conditions~~,~~ and include four rainfall volume scenarios with varying durations. The Flow Volume Calculation Matrix for subcatchment areas BB-L16 and BB-L17 assume that all stormwater generated on the waterfront projected development sites (Projected Development Sites 63, 64, 65, 67, 69, 71) would be discharged to the river as direct drainage, as noted above.

The summary tables of the Flow Volume Calculation Matrices are included in **Table 11-9**.

Table 11-9
Flow Volume Matrix: Existing and With Action Volume Comparison

Subcatch-ment Area	Total Area (Acres)	Rainfall Volume (in.)	Rainfall Duration (hr.)	Weighted Runoff Coefficient	Runoff Volume to Direct Drainage (MG)	Runoff Volume to CSS (MG)*	Sanitary Volume to CSS (MG)	Total Volume to CSS (MG)	Weighted Runoff Coefficient	Runoff Volume to Direct Drainage (MG)	Runoff Volume to CSS (MG)*	Sanitary Volume to CSS (MG)	Total Volume to CSS (MG)	Increased Total Volume to CSS (MG)*
				Existing					With Action					
BB-L15	1.38	0.00	3.80	0.85	0.00	0.00	0.00	**0.00**	0.99	0.00	0.00	0.02	**0.02**	0.02
		0.40	3.80		0.00	0.01	0.00	**0.01**		0.00	0.01	0.02	**0.03**	0.02
		1.20	11.30		0.00	0.04	0.00	**0.04**		0.00	0.04	0.05	**0.09**	0.05
		2.50	19.50		0.00	0.08	0.00	**0.08**		0.00	0.09	0.08	**0.17**	0.09
BB-L16	7.6	0.00	3.80	0.97	0.00	0.00	0.01	**0.01**	0.97 (CSS) 0.84 (DD)	0.00	0.00	0.11	**0.11**	0.10
		0.40	3.80		0.00	0.08	0.01	**0.09**		0.03	0.05	0.11	**0.16**	0.07
		1.20	11.30		0.00	0.24	0.04	**0.28**		0.08	0.14	0.34	**0.48**	0.20
		2.50	19.50		0.00	0.50	0.06	**0.56**		0.17	0.30	0.58	**0.88**	0.32
BB-L17	24.4	0.00	3.80	0.93	0.00	0.00	0.03	**0.03**	0.97 (CSS) 0.81 (DD)	0.00	0.00	0.42	**0.42**	0.39
		0.40	3.80		0.00	0.25	0.03	**0.28**		0.14	0.14	0.42	**0.56**	0.29
		1.20	11.30		0.00	0.74	0.08	**0.83**		0.42	0.42	1.26	**1.68**	0.85
		2.50	19.50		0.00	1.55	0.14	**1.69**		0.87	0.88	2.17	**3.05**	1.35
BB-L18	15.36	0.00	3.80	0.96	0.00	0.00	0.02	**0.02**	0.99	0.00	0.00	0.17	**0.17**	0.15
		0.40	3.80		0.00	0.16	0.02	**0.18**		0.00	0.16	0.17	**0.33**	0.15
		1.20	11.30		0.00	0.48	0.06	**0.54**		0.00	0.49	0.50	**0.99**	0.45
		2.50	19.50		0.00	1.00	0.11	**1.11**		0.00	1.03	0.86	**1.89**	0.78
BB-L19	2.21	0.00	3.80	0.92	0.00	0.00	0.00	**0.00**	0.95	0.00	0.00	0.05	**0.05**	0.05
		0.40	3.80		0.00	0.02	0.00	**0.02**		0.00	0.02	0.05	**0.07**	0.05
		1.20	11.30		0.00	0.07	0.01	**0.07**		0.00	0.07	0.15	**0.21**	0.14
		2.50	19.50		0.00	0.14	0.01	**0.15**		0.00	0.14	0.25	**0.40**	0.25

Notes:
* Assumes no on-site detention or BMPs for purposes of calculations.
CSS = Combined Sewer System; DD = Direct Drainage; MG = Million Gallons
Totals may not sum due to rounding.

As shown in **Table 11-9**, in all rainfall volume scenarios flow to the combined sewer system would increase as compared to existing conditions. The largest increase would occur within subcatchment area BB-L17 (up to 1.35 million gallons during storm events with up to 2.5 inches of rainfall).[4] The increases in flow are primarily attributable to the increase in sanitary flow resulting from denser development (particularly residential development) on the projected development sites with the Proposed Actions. As shown in **Table 11-9**, there would be a comparatively smaller increase in stormwater flows to the system as compared to existing conditions. Notably, in subcatchment areas BB-L16 and BB-L17, there would be a reduction in stormwater flows to the combined sewer system as a result of waterfront projected development sites directly discharging stormwater to the river.

Increased volumes and flows would be conveyed to the Bowery Bay WRRF or discharged directly to the East River, depending on rainfall volume and duration. However, the table does not account for the DEP-regulated stormwater flow rate: in particular, as described in greater detail below, DEP requires substantial stormwater detention for developments or building alterations if the developed sites' storm flows exceed the allowable flow of the drainage plan. As a result of these requirements, given that the existing development

[4] Totals represent the incremental increase in total volume discharged to the combined sewer system (CSS) during the largest storm scenario represented in the Flow Volume Calculation Matrix.

sites are unlikely to provide significant detention, it is expected that there would be an increase in on-site detention and retention as a result of the Proposed Actions. This improved on-site stormwater management on the redeveloped properties is substantial enough that it is expected to offset the increase in sanitary flow, so CSO volumes would decrease overall.

Following the guidelines of the *CEQR Technical Manual*, a detailed analysis is warranted when the preliminary assessment finds that there would be a significant increase in sanitary or stormwater discharges which may impact capacity in the existing sewer system, exacerbate CSO volumes and/or frequencies, or contribute greater pollutant loadings in combined sewage discharged to receiving waterbodies. Based on the preliminary analysis of increased flows to the combined sewer system presented in the Flow Volume Calculation Matrix, and in consideration of the on-site stormwater management volume requirements, it is concluded that the projected increased flows to the combined sewer system would not have a significant adverse impact on water quality, and detailed analysis is not warranted.

STORMWATER BEST MANAGEMENT PRACTICES

Because the City's sewers are sized and designed based on the designated zoning of an area, and related population density and surface coverage characteristics, the Proposed Actions may result in development that is inconsistent with the design of the existing built sewer system. It is expected that an Amended Drainage Plan (ADP) will be prepared for the Project Area.

The Proposed Actions would result in increased development and population density which could require a hydraulic analysis of the existing sewer system when proposed developments seek sewer connections. The hydraulic analysis would be required prior to the submittal of an SCP application to determine whether the existing sewer system is capable of supporting new development and related increase in wastewater flow. As part of the SCP permit approval processes, developments must be in compliance with the required on-site stormwater volume requirements and stormwater release rate as detailed in the Unified Stormwater Rule. Upgrades to the sewer system may also be required of the applicant at the time of the SCP in accordance with the ADP.

Each development site, regardless of lot size, will trigger Chapter 31 of the Unified Stormwater Rule and will be required to implement slow-release drainage controls to meet the updated on-site release rate and volume requirements. There is no available waiver to the SMP hierarchy, and documentation must be provided to move from a higher tier to a lower tier of the SMP hierarchy. The Unified Stormwater rule therefore ensures that redeveloped properties manage more total stormwater and manage it more efficiently than under pre-development (No Action) conditions.

Enhanced stormwater management throughout the City is consistent with recent policies, including the NYC Green Infrastructure Plan and OneNYC. The NYC Green Infrastructure Plan, released in September 2010, includes a goal of reducing CSOs by 1.67 billion gallons per year by 2030 through the implementation of retention or detention practices. Implementation of low-flow fixtures, as per the New York City Plumbing Code, Local Law 33 of 2007, and the U.S. Environmental Protection Agency's (EPA) WaterSense Program, would also help to control sanitary flows.

The projected growth under the Proposed Actions would increase sanitary flows to the City's combined sewer system. However, it is expected that there would be a decrease in the volume of CSO discharge during rain events as a result of the increased direct stormwater discharge from the waterfront projected development sites as well as the increased detention of stormwater runoff to be implemented with the new developments in accordance with the Unified Stormwater Rule. Because of the available treatment capacity at the Bowery Bay WRRF, the projected increase in sanitary flows would also not result in any significant adverse impact on that WRRF. For these reasons, it is concluded that the Proposed Actions would not result in significant adverse impacts to local water supply or wastewater and stormwater conveyance and treatment infrastructure. ✷